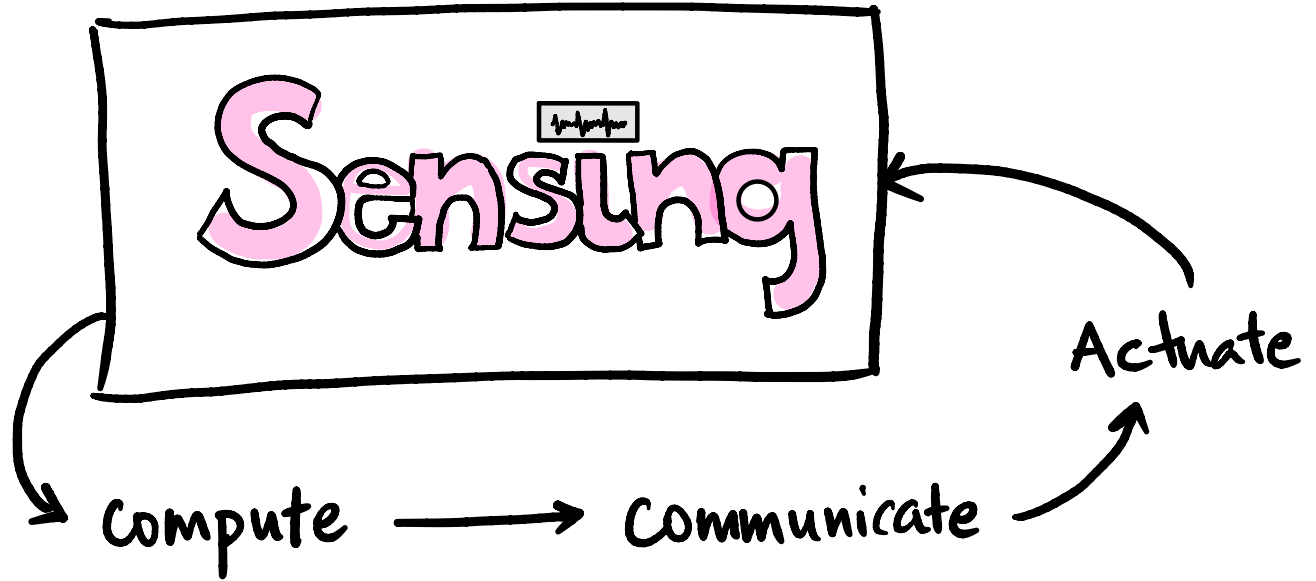
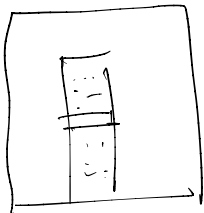
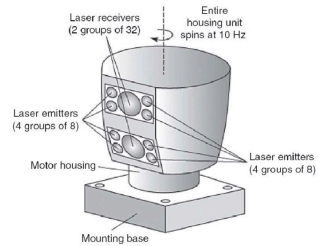


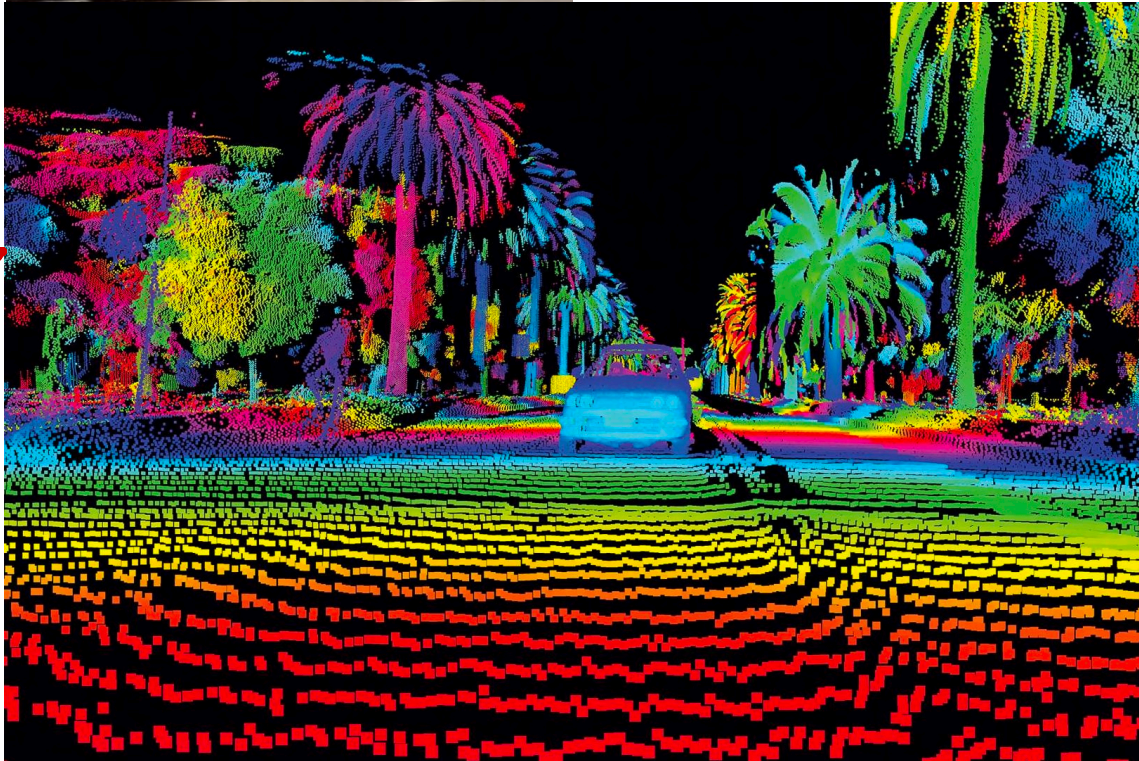
# Part 3

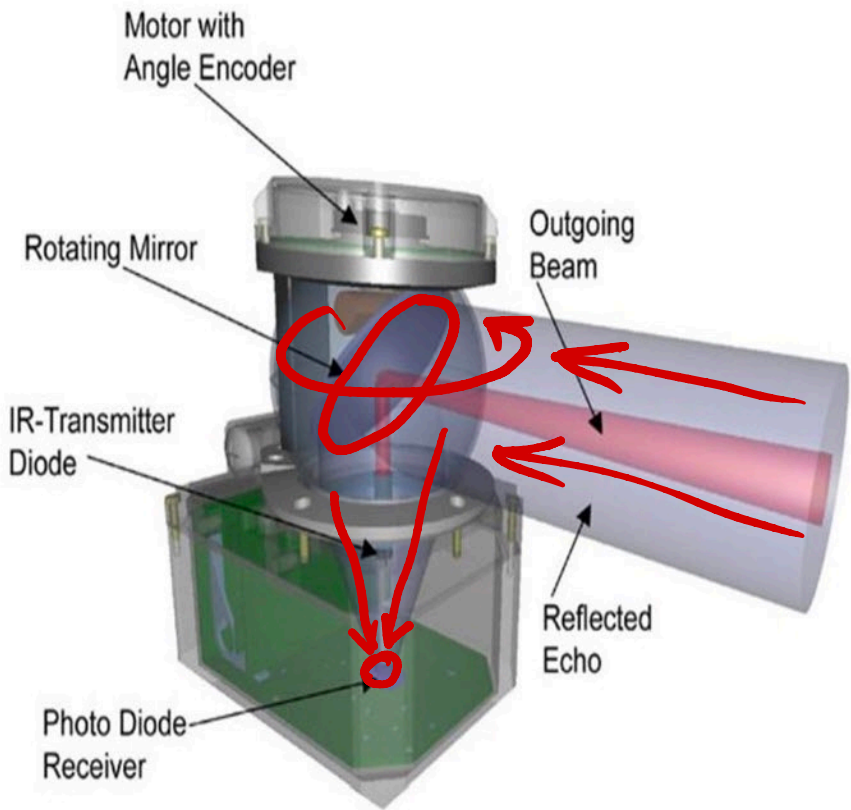
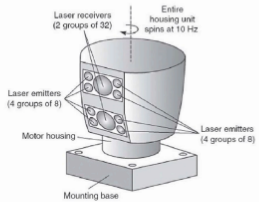


# LIDAR

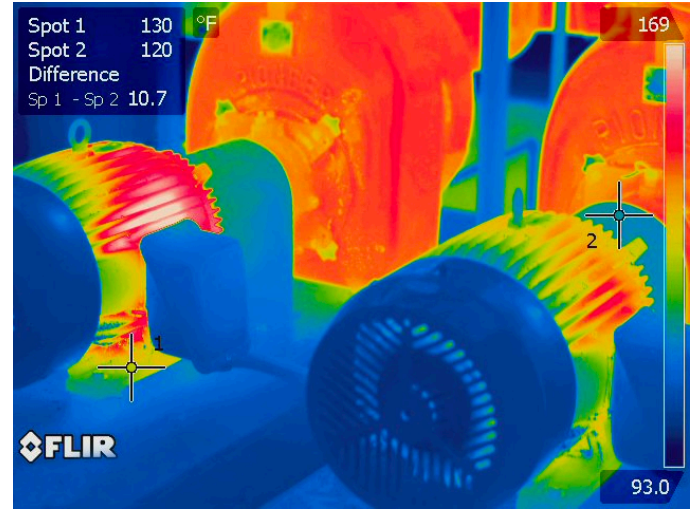


3D  
Point  
cloud



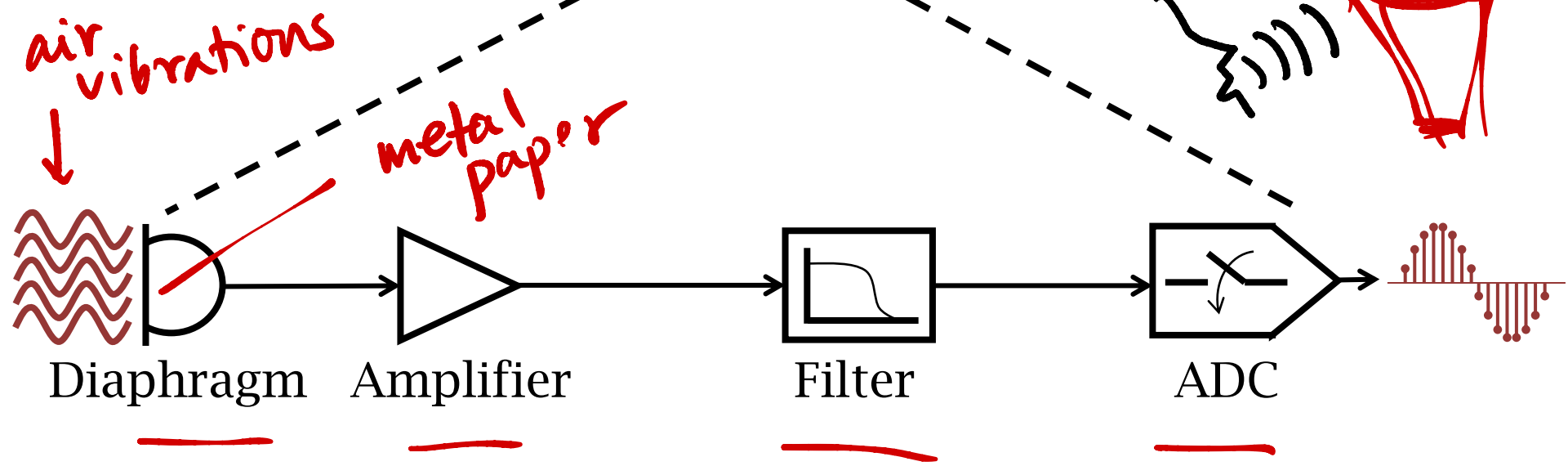


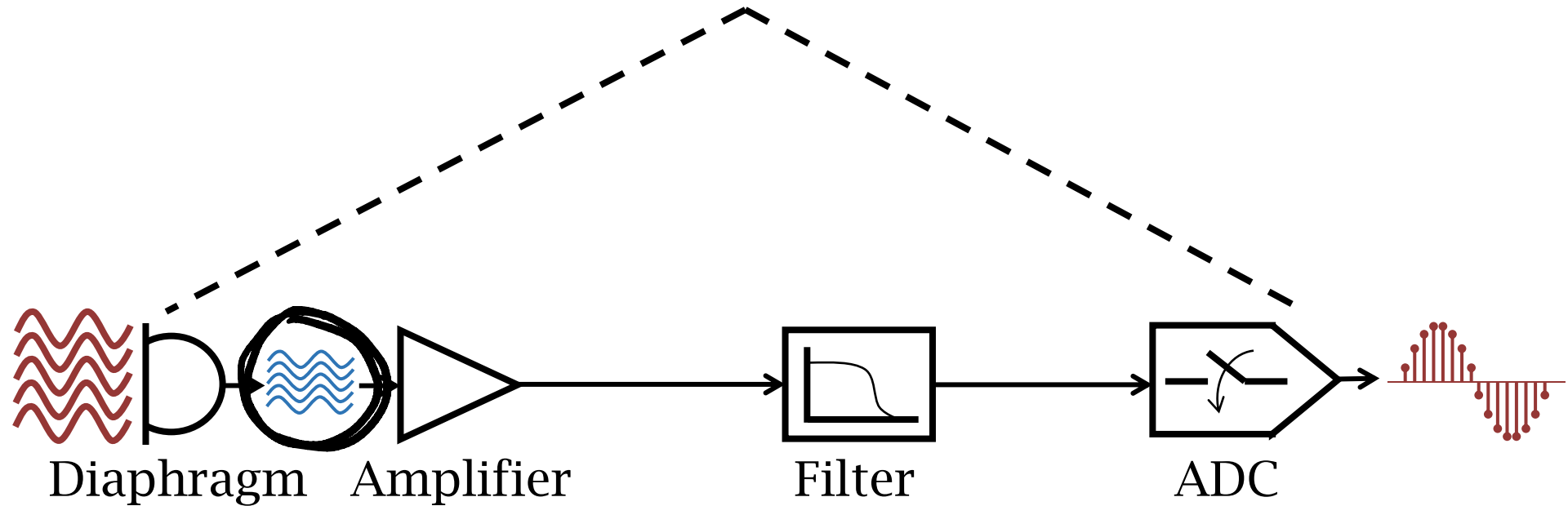
# Infra Red Camera

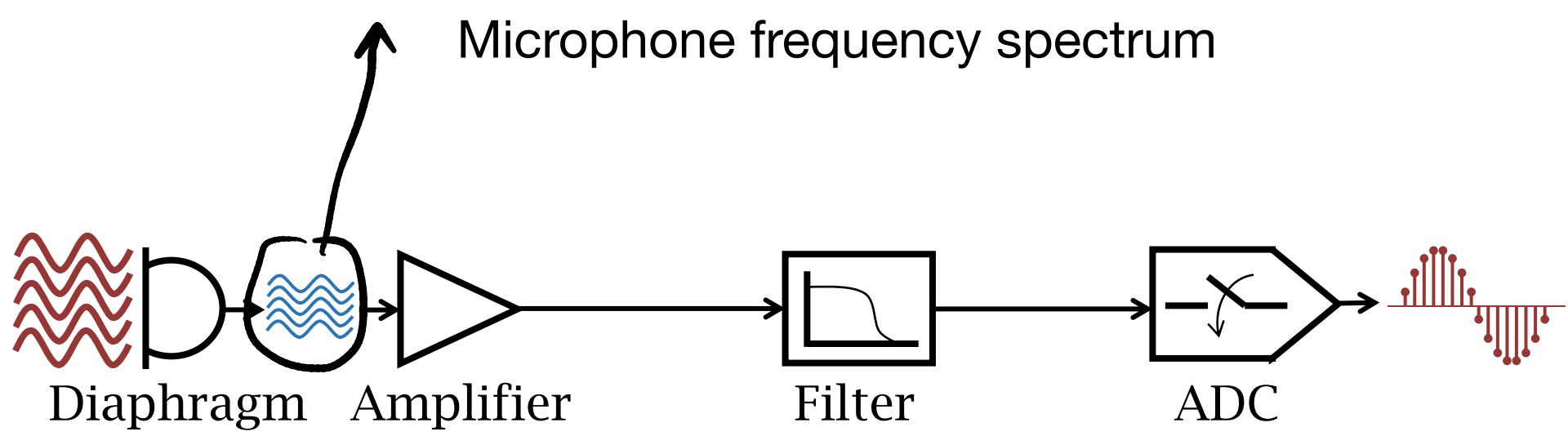
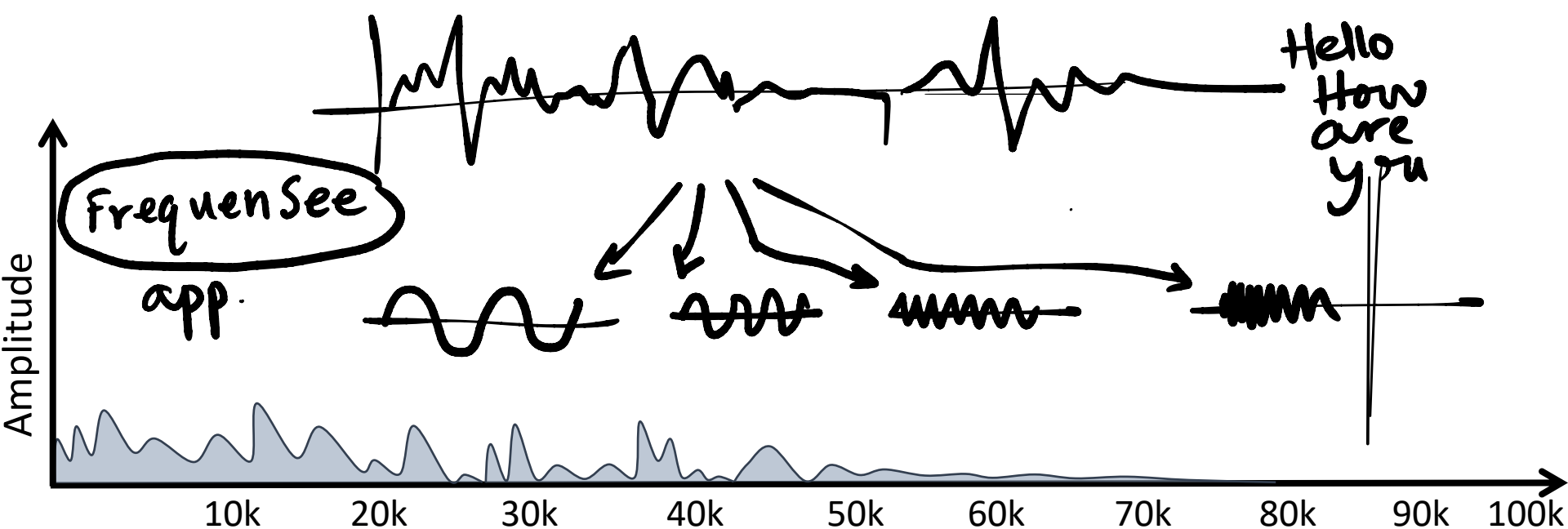


Microphone → transducer

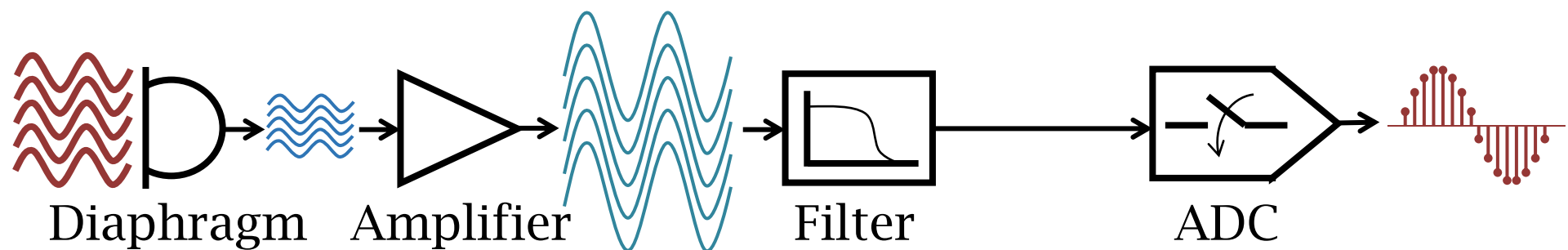
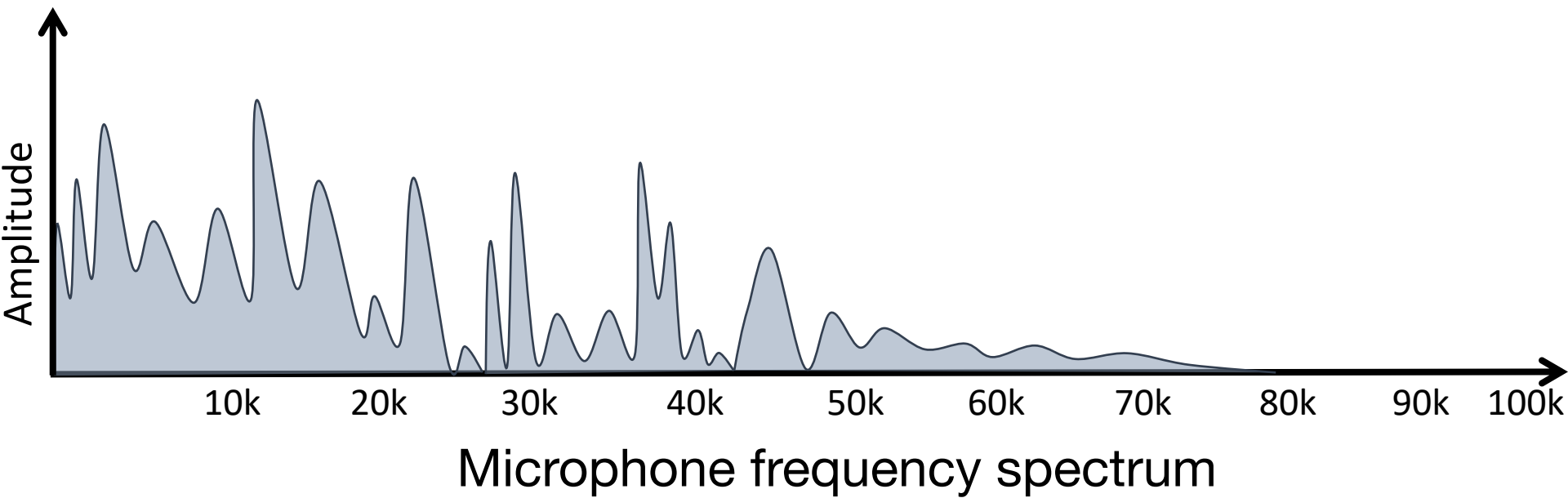


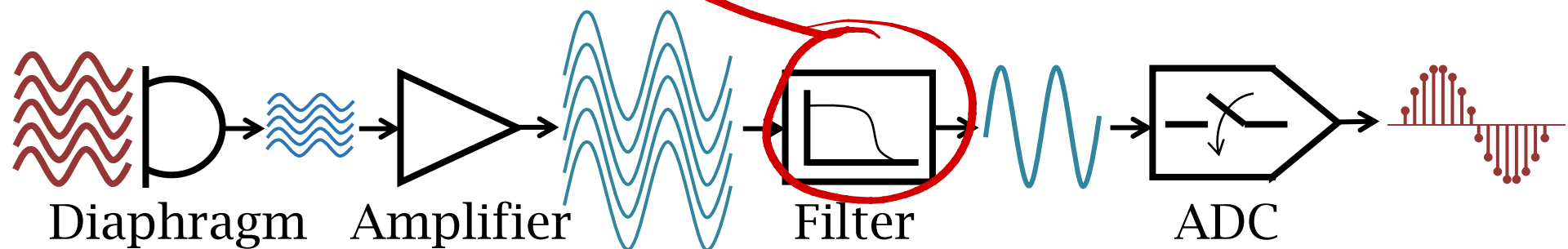
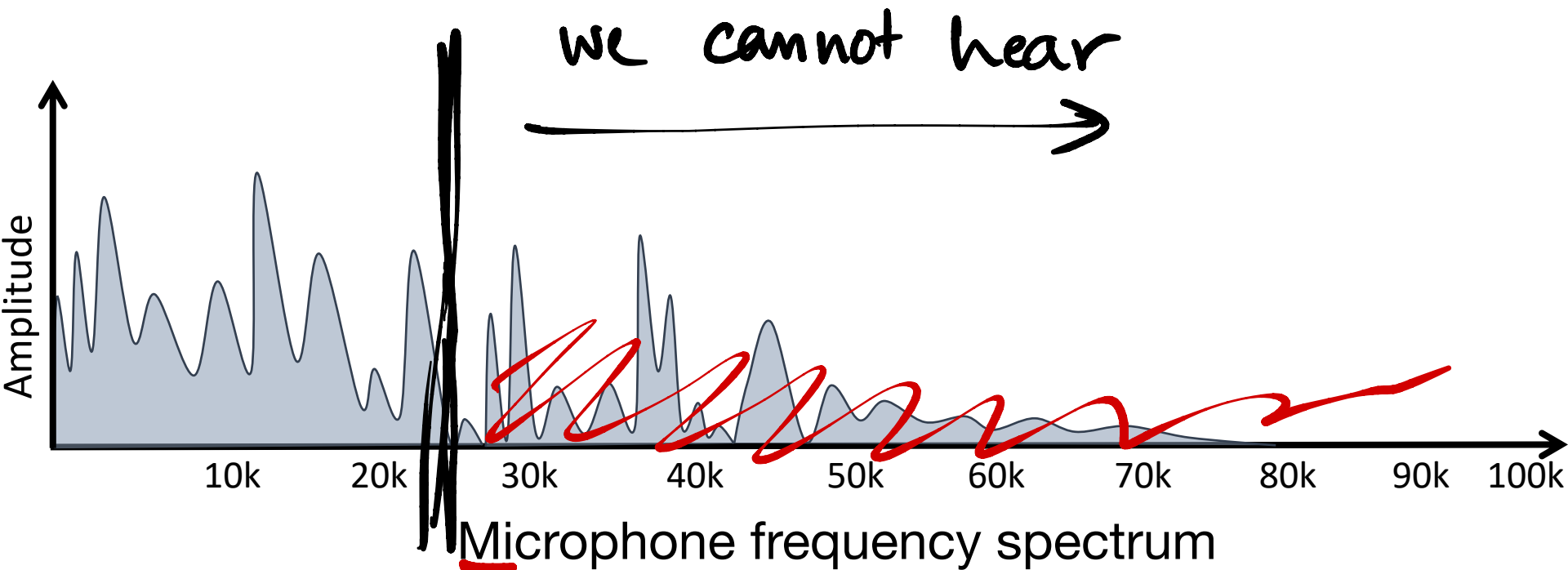


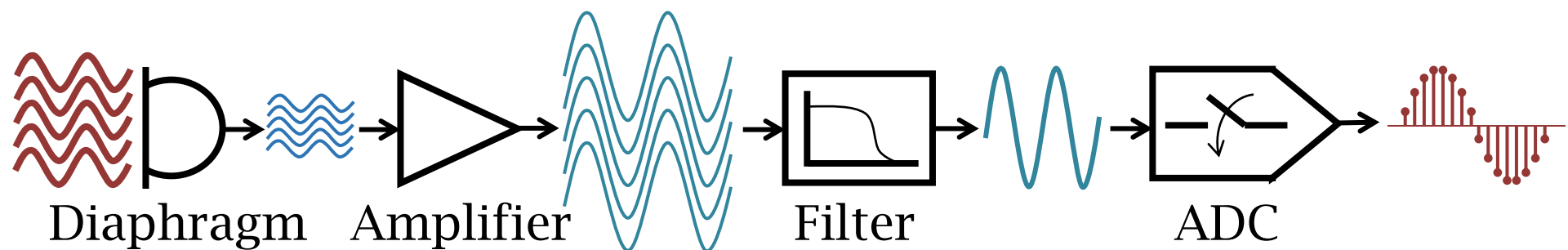
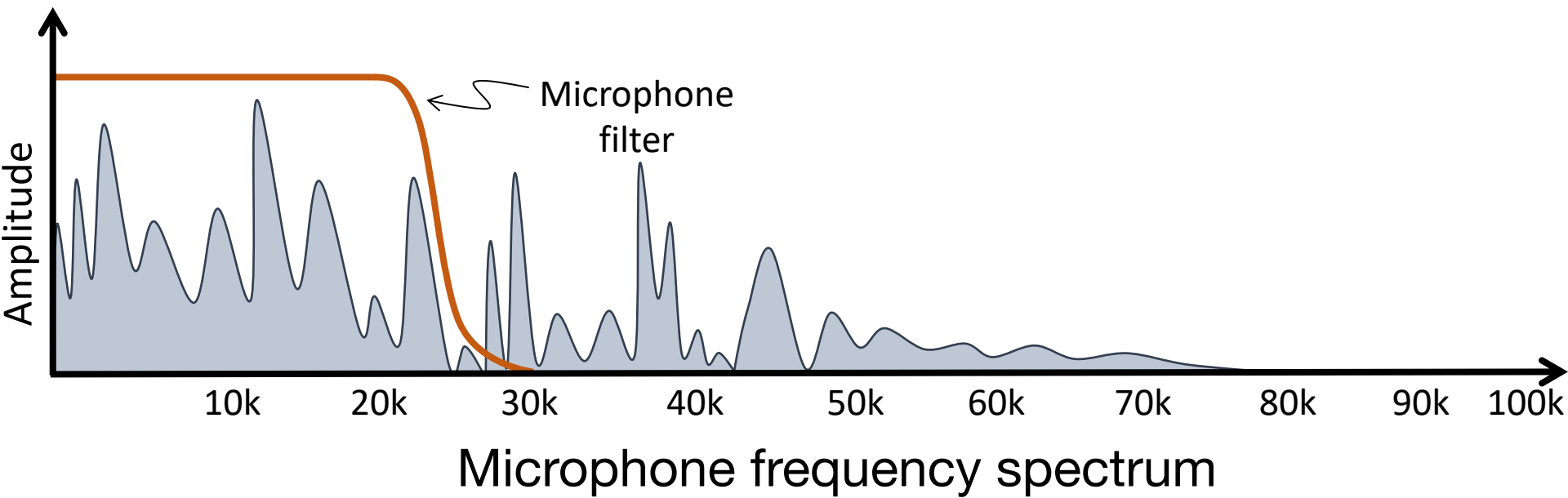


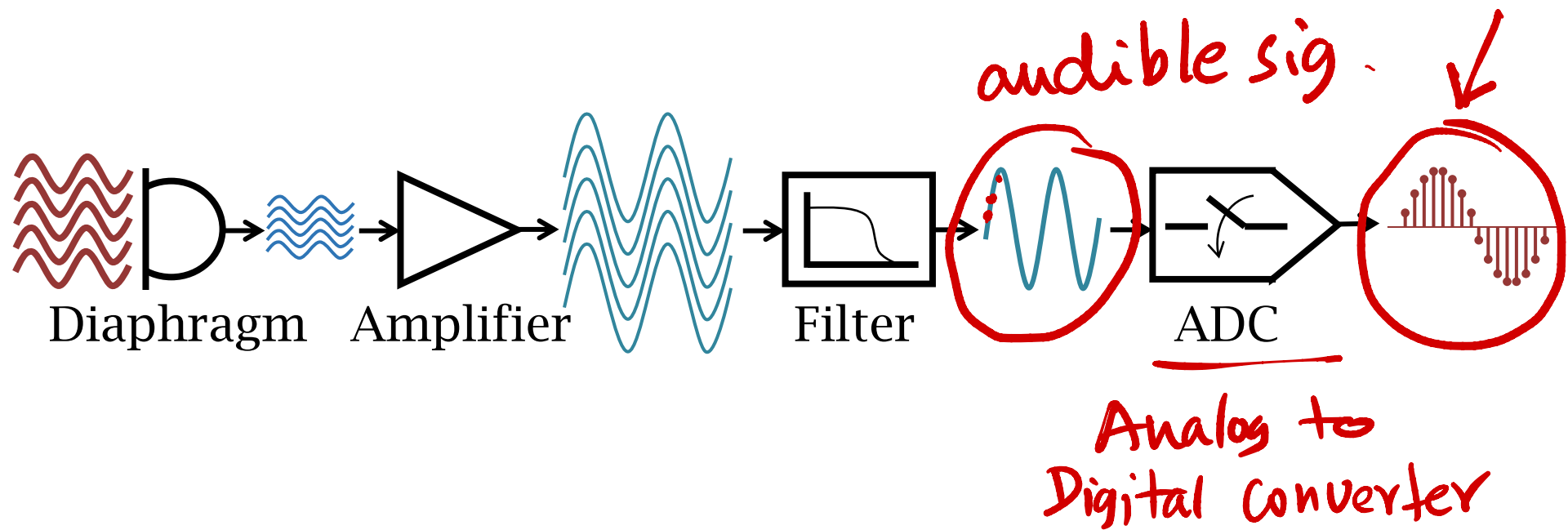
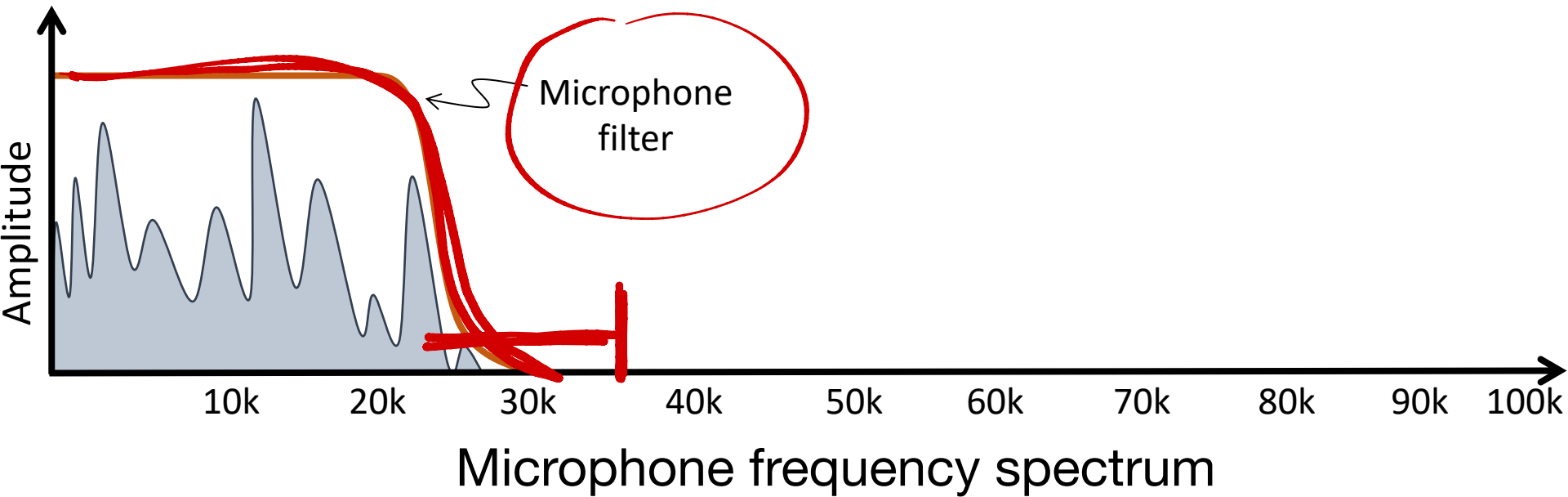




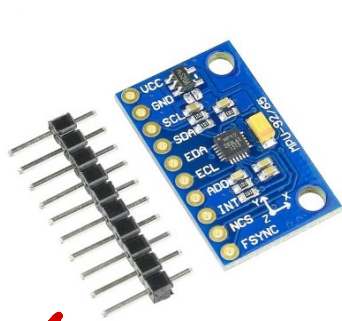








# Motion Sensing (IMU) → Inertial Measurement Unit



Accelerometer

Gyroscope

Magnetometer



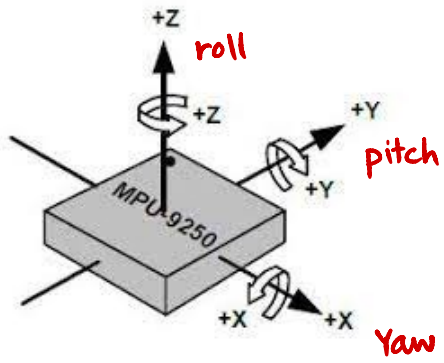
Wide applications in motion tracking

3 sensors :

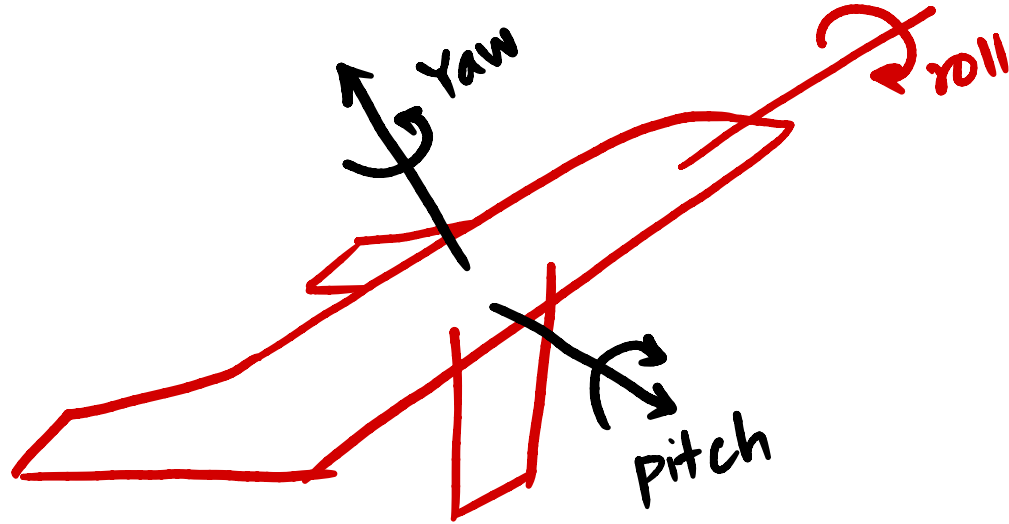
accelerometer

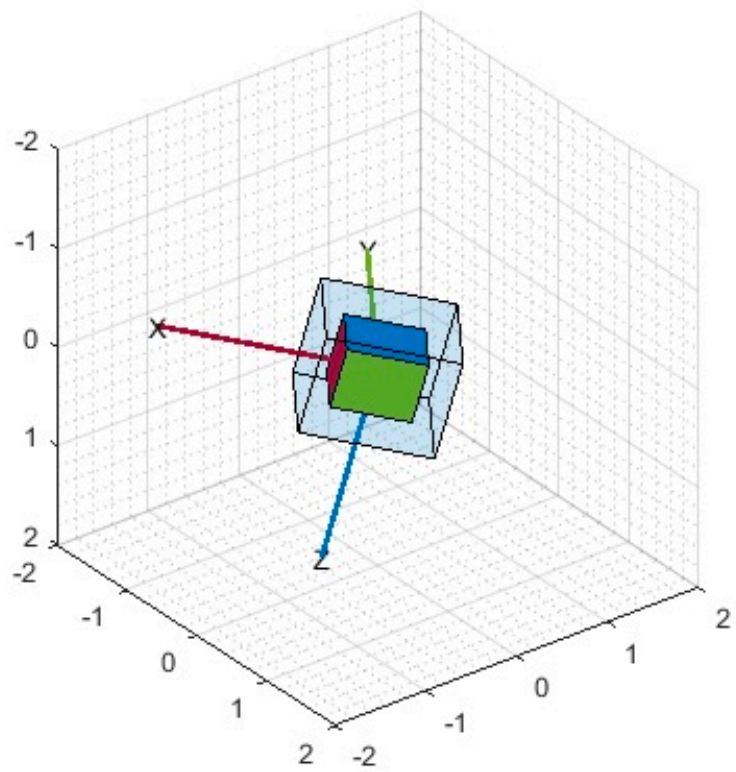
gyroscope

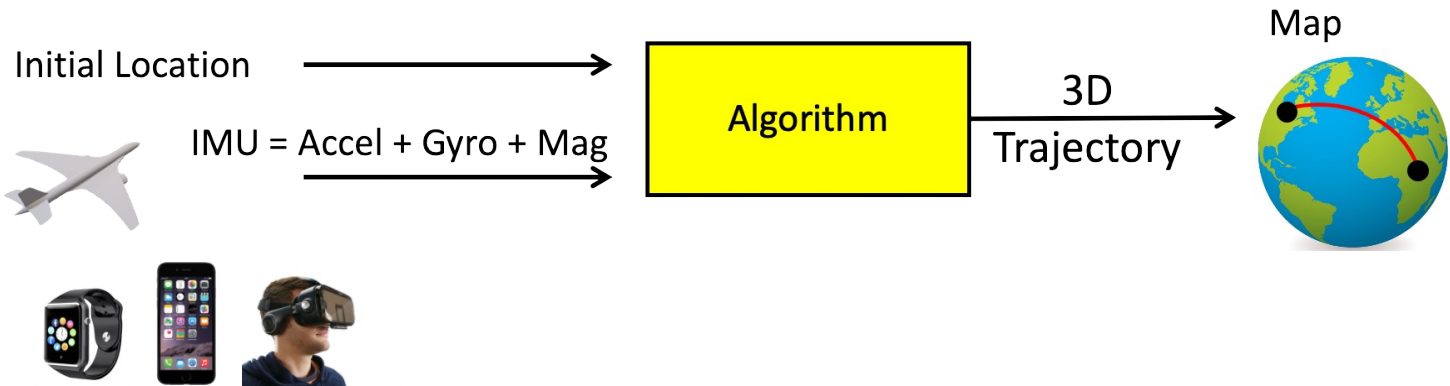
magnetometer



<https://youtu.be/6ijArKE8vKU>







Zoom into IMU data:

$$\text{Accel.} = \begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix}$$

(Linear Acceleration)

$$\text{Gyro.} = \begin{bmatrix} g_x \\ g_y \\ g_z \end{bmatrix}$$

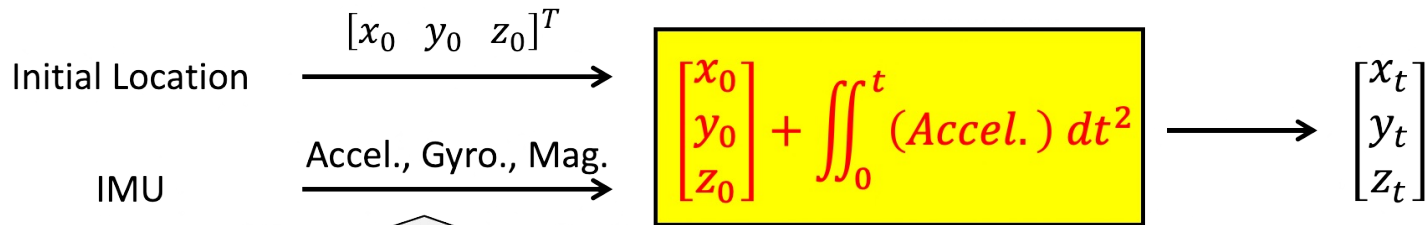
(Angular Velocity)

Delta rotation in unit time

$$\text{Mag.} = \begin{bmatrix} m_x \\ m_y \\ m_z \end{bmatrix}$$

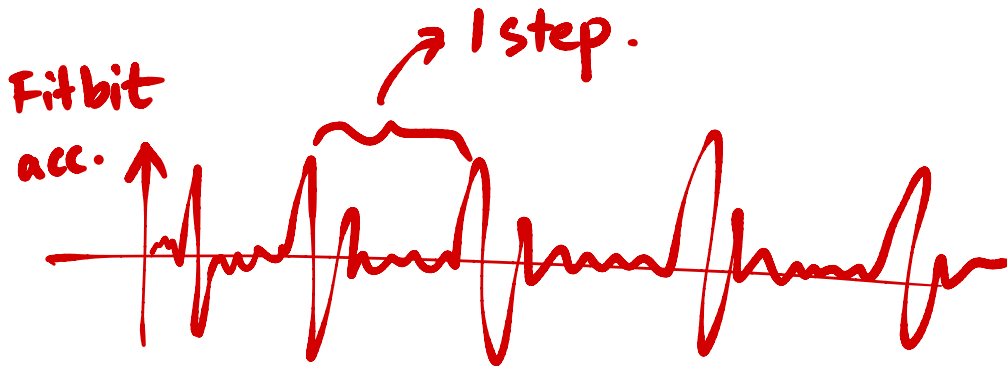
(Earth's Magnetic North)





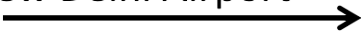
Zoom into IMU data:

$\text{Accel.} = \begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix}$ <p>(Linear Acceleration)</p>	$\text{Gyro.} = \begin{bmatrix} g_x \\ g_y \\ g_z \end{bmatrix}$ <p>(Angular Velocity) <span style="color: red;">↑</span> Delta rotation in unit time</p>	$\text{Mag.} = \begin{bmatrix} m_x \\ m_y \\ m_z \end{bmatrix}$ <p>(Earth's Magnetic North)</p>
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New Delhi Airport



Accelerating



$a_x$ : Frontwards

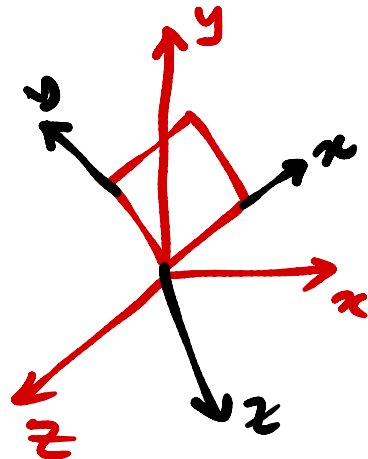
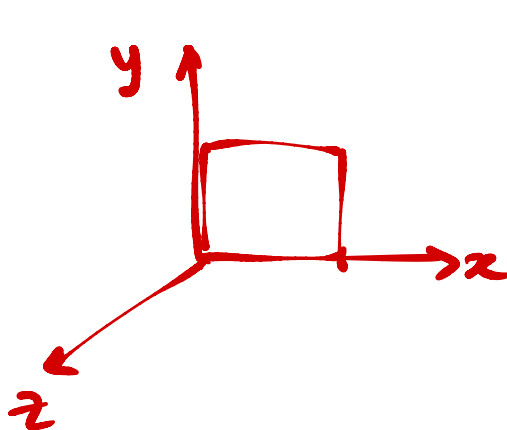
$a_y$ : Rightwards

$a_z$ : Upwards

What is  
- Frontwards  
- Rightwards  
- Upwards  
w.r.t. the earth?

3D  
Trajectory

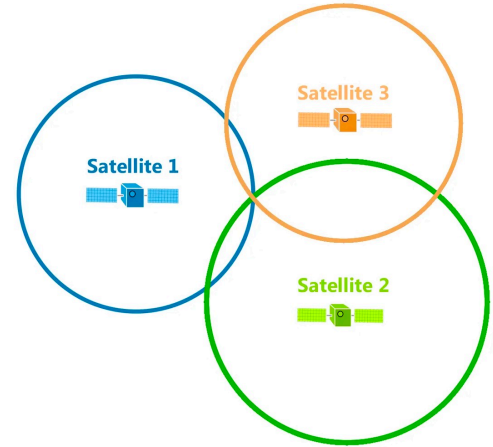
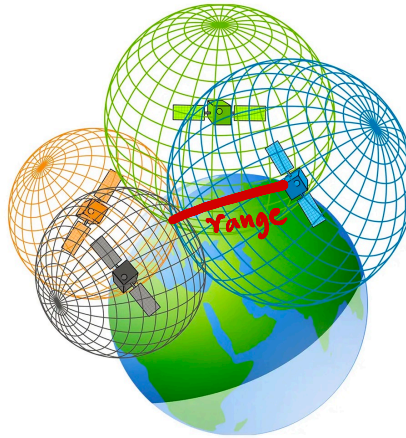
Map



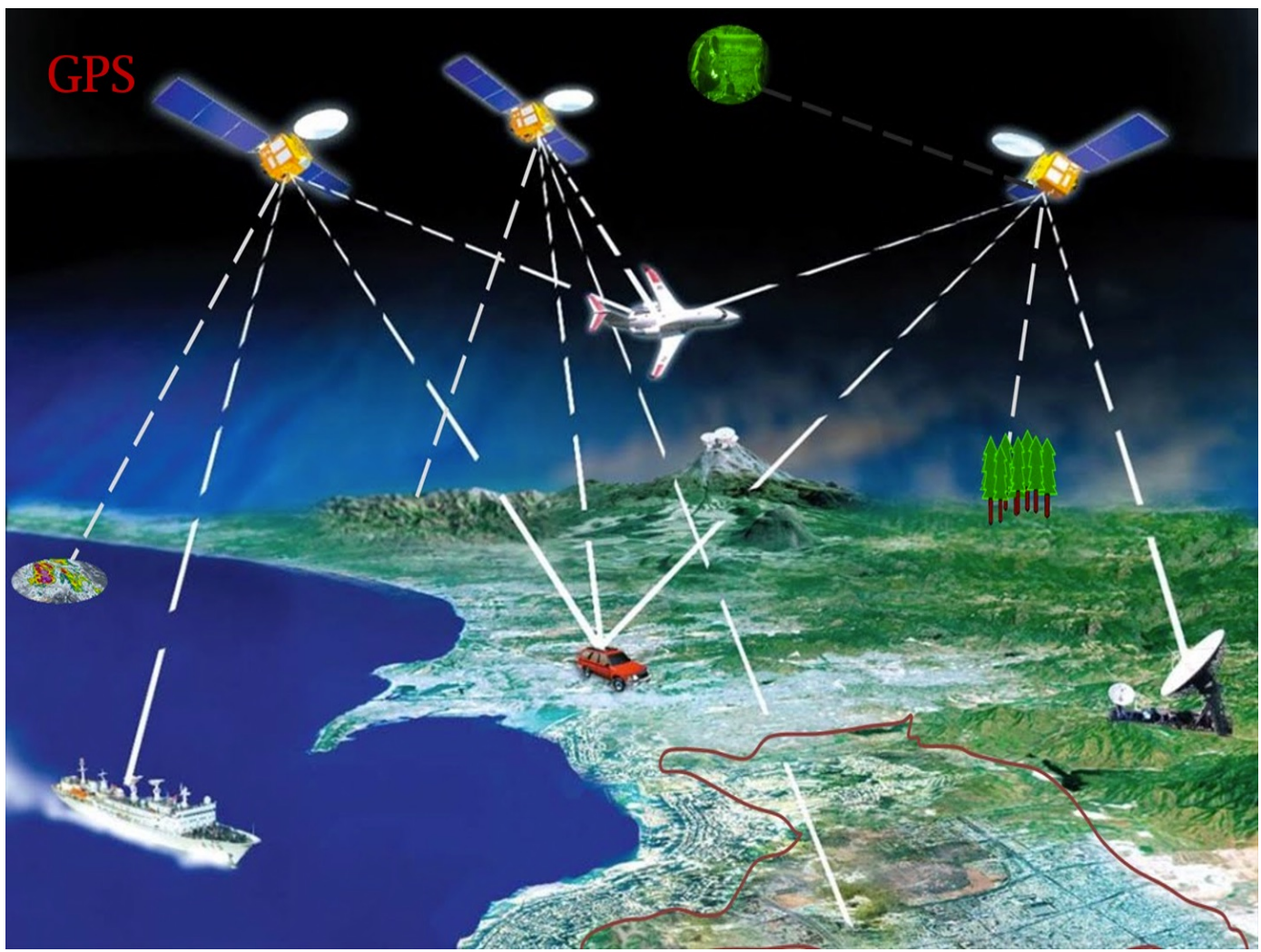
# Wireless GPS

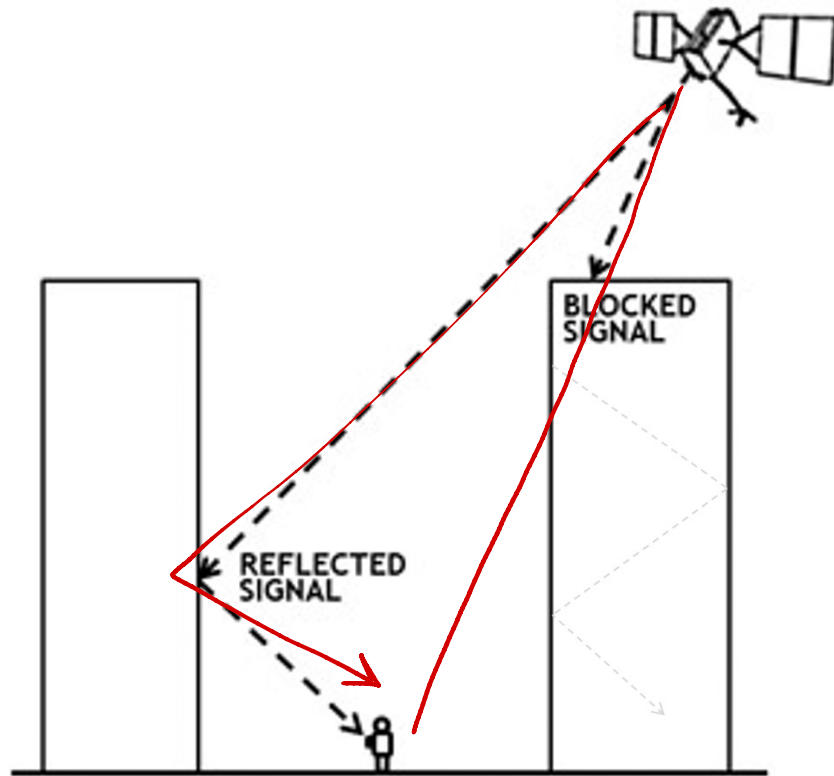


# Trilateration

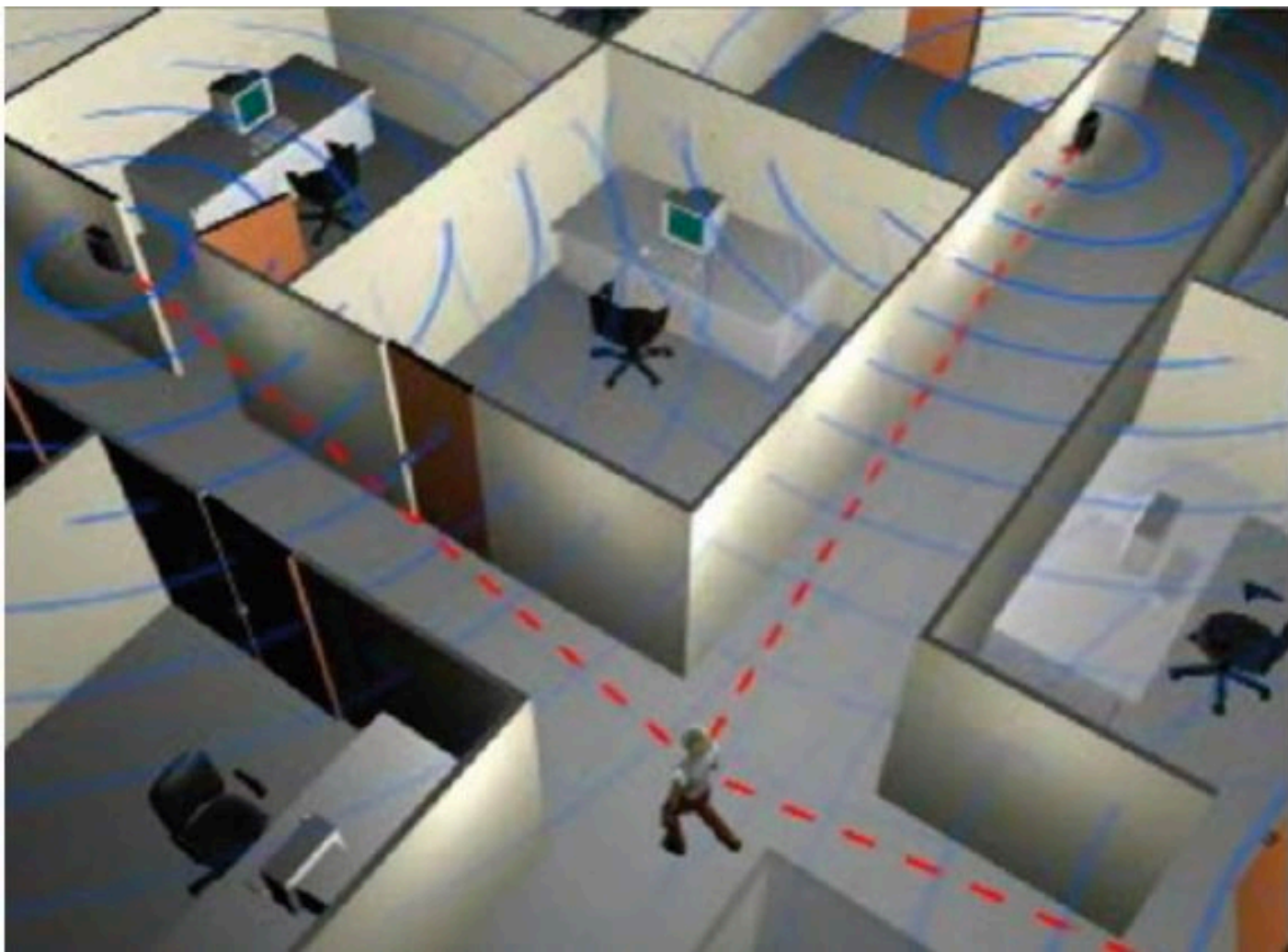


GPS

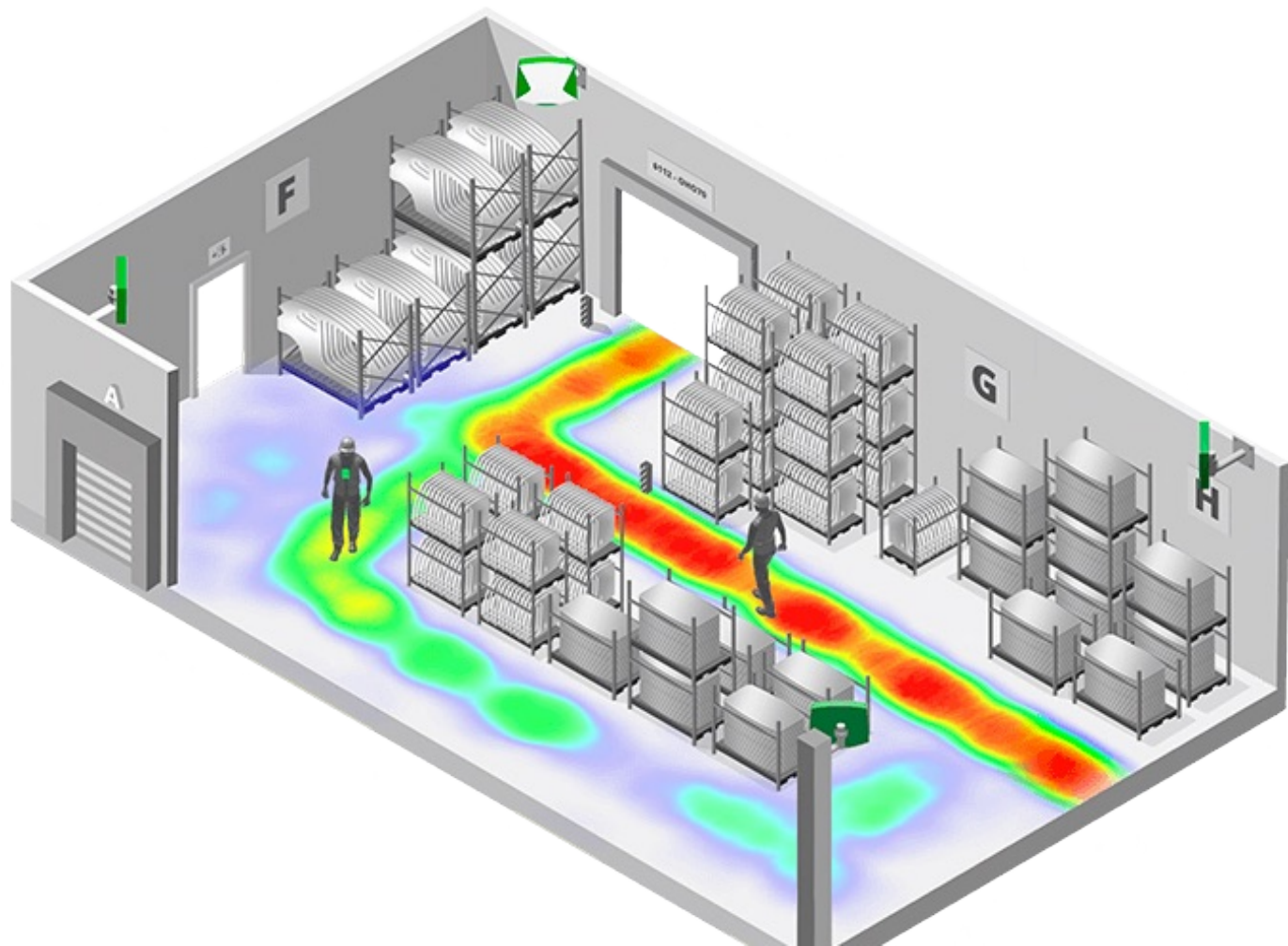




WiFi  
Location  
(Indoor)







# Other Sensors

Flow sensor

